Second

FIVE-YEAR REVIEW REPORT

Palmerton Zinc Pile

Superfund Site

Palmerton, Carbon County, Pennsylvania

February 2002

Prepared By:

U.S. Environmental Protection Agency

Region III

Philadelphia, Pennsylvania

_____ _____

Abraham Ferdas, Director
Hazardous Site Cleanup Division
U. S. EPA - Region III

Date

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Attachments

List of Acronyms

ARAR	Applicable or Relevant and Appropriate Requirement
ATSDR	Agency for Toxic Substances and Disease Registry
CAA	Clean Air Act
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMP	Corrugated Metal Pipe
CRREL	Cold Regions Research and Engineering Laboratory (USACE)
CWA	Clean Water Act
DOJ	United States Department of Justice
EAF	Electric Arc Furnace Dust
ECOLOAM	Mixture of fly ash, sewage sludge and lime.
EDD	Eastern Diversion Ditch
EPA	United States Environmental Protection Agency - Region III
ESD	Explanation of Significant Differences
HSCD	Hazardous Site Cleanup Division
HWMD	Hazardous Waste Management Division
G&W	Gulf and Western Industries, Inc.
GCL	Geosynthetic Clay Liner
HII	Horsehead Industries, Incorporated
HRD	Horsehead Resource Development Company, Inc.
IRM	Iron-rich Material
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MRZ	Metal Reduction Zone
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEIC	National Enforcement Investigations Center
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRCS	National Resources Conservation Service
O&M	Operations and Maintenance
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
PADEP	Pennsylvania Department of Environmental Protection
pH	Potential of Hydrogen
ppm	Parts Per Million
PRP	Potentially Responsible Party
PRT	Pollution Reduction Technology
PVC	Poly-Vinyl Chloride
QA/QC	Quality Assurance/Quality Control

List of Acronyms

RA	Remedial Action
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
RPM	Remedial Project Manager
ROD	Record of Decision
SDWA	Safe Drinking Water Act
TCI	TCI Pacific Communications, Incorporated
UAO	Unilateral Administrative Order
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
VIACOM	Viacom International Inc.
WES	Waterways Experiment Station (USACE)
ZCA	Zinc Corporation of America

Executive Summary

The Palmerton Zinc Pile Superfund Site (Site) in Palmerton, Pennsylvania, is composed of four Operable Units (OUs): OU 1 - Blue Mountain; OU 2 - Cinder Bank; OU 3 - Community Soils; and OU 4 - Area-Wide Groundwater and Surface Water Study & Site-Wide Ecological Risk Assessment. The remedies for the Site include stabilization and capping of contaminated soils (OU 1 & OU 2), runoff diversion, leachate collection and treatment (OU 2), remediation of contaminated residential soils and house dust (OU 3), and institutional controls (OU 2, & OU 3). Construction completion has not yet been attained. The trigger for this Five-Year Review was the completion date of the first Five-Year Review report, September 30, 1996.

The assessment for this Five-Year Review found that the remedies selected in the Records of Decision (RODs) for OU 1 and OU 2 are being constructed in accordance with the ROD requirements. The implementation of the ROD remedy for OU 3 is currently being negotiated between the U.S. Environmental Protection Agency - Region III (EPA) and the Potentially Responsible Parties (PRPs). The OU 3 ROD was issued on October 9, 2001. The Remedial Investigation (RI) for OU 4 is nearing completion. The protectiveness statement for each OU is as follows:

Protectiveness Statements:

Operable Unit 1 - Blue Mountain: The remedy is expected to be protective of human health and the environment upon completion.

Operable Unit 2 - Cinder Bank: The remedy is expected to be protective of human health and the environment upon completion.

Operable Unit 3 - Community Soils: The remedy is expected to be protective of human health and the environment upon completion. However, until the remedy selected in the October 9, 2001 ROD is implemented, the following issues remain:

1. Homes with exterior soil lead levels above 650 ppm which were not remediated during the interim removal action need to be evaluated in accordance with the ROD.
2. Playground areas in the residential communities need to be remediated if lead levels are found to be above 400 ppm.
3. A notification mechanism to protect future residential buyers of homes found to have soil lead levels above 650 ppm but which will not be remediated needs to be implemented. [Protection of future residential buyers by instituting a notification mechanism needs to be implemented for homes found to have soil lead levels above 650 ppm but which will not be remediated.]

The following remedies for the above issues, as cited in the ROD issued on October 9, 2001, need to be taken to ensure protectiveness:

1. Exterior soil and interior dust remediation until clean-up standards are obtained in accordance with the ROD.
2. Sampling and clean up of residential play areas in accordance with the ROD.
3. In accordance with the ROD, implementation of Institutional Controls to notify potential buyers of a property of the existence of sampling information.

Consent Decree negotiations are currently underway between EPA and the PRPs for implementation of the above remedies.

Operable Unit 4 - Area-Wide Groundwater and Surface Water Investigation:

A protectiveness determination cannot be made at this time until further information is obtained. Further information will continue to be obtained during the Remedial Investigation/Feasibility Study (RI/FS), currently underway. It is expected that the RI/FS will be completed by 2003, at which time a protectiveness determination will be made. It should be noted that exposure to groundwater is minimal since most of the potentially affected area is connected to a public water supply. The few nearby residential wells have been sampled and do not exhibit contaminants that can be currently attributed to on-site groundwater.

Five-Year Review Summary Form

SITE IDENTIFICATION

EPA ID: PAD002395887

Region: 3	**State: PA**	**City/County: Palmerton/Carbon County**

SITE STATUS

NPL status: 6 Final o Deleted o Other (specify)_____

Remediation Status (choose all that apply): 6 Under Construction o Operating o Complete

Multiple OUs?* 6 YES o NO	**Construction completion date: ____/____/____**

Has site been put into reuse? o YES 6 NO

REVIEW STATUS

Lead agency: 6 EPA o State o Tribe o Other Federal Agency_____

Author(s) name: ** Charlie Root/Alexis Alexander

Author(s) title: Remedial Project Managers	**Author(s) Affiliation: U.S. EPA - Region 3**

Review period:* 07 / 30 / 2001 to 12 / 31 / 2001**

Date(s) of site inspection: 09 / 11 / 2001

Type of review:
6 Post-SARA o Pre-SARA o NPL-Removal only
o Non-NPL Remedial Action Site o NPL State/Tribe-lead
o Regional Discretion

Review number: o 1 (first) 6 2 (second) o 3 (third) o Other(specify)_____

Triggering action:
o Actual RA Onsite Construction at OU # _____ o Actual RA Start at OU# _____
o Construction Completion 6 Previous Five-Year Review Report
o Other (specify)

Triggering action date: 09 / 26 / 1996

Due date (five years after triggering action date: 09 / 26 / 2001

* ("OU" refers to operable unit.)

Five-Year Review Summary Form, cont'd

Issues:

Blue Mountain (OU 1):

1. Although revegetation via grass seed was highly successful, initial tree seeding of the 775 remediated acres on Blue Mountain (OU 1) and a subsequent planting of tree seedlings has not been successful. In addition, limited sampling data may indicate that translocation of contaminants is occurring through plant uptake. The extent of translocation of contaminants through plant uptake and it's effects on the remedy, if any, need to be determined.

2. Remaining denuded acreage of Blue Mountain (OU 1) needs to be revegetated. Application rates, uniform coverage, areal extent to be remediated, types of grasses, long term survivability and performance standard issues in test plots need to be resolved.

Cinder Bank (OU 2):

3. Complete construction of Metal Reduction Zones (MRZs) and remaining revegetation on the Cinder Bank (OU 2).

4. Address access restrictions and long term O&M of burning areas of Cinder Bank (OU 2).

Community Soils (OU 3):

5. Need to design and construct the remedy called for in the October 9, 2001 ROD (OU 3).

Recommendations and Follow-Up Actions:

1. Monitor and evaluate the completed portion of Blue Mountain for long term vegetation survivability and translocation of contaminants (OU 1).
2. Sample and analyze appropriate plant species for metals to determine if translocation is occurring (OU 1) and if it is causing adverse effects.
3. Periodically, on an as-needed basis, if appropriate, remove volunteer tree species with high metal uptake (i.e., Birch, Poplar, etc.) (OU 1), repair areas of vegetative die off, or apply soil amendments to minimize contaminant uptake.
4. Utilize a revegetation approach that has minimum metal uptake on the remaining acreage of Blue Mountain (OU 1) to ensure long term survivability and minimize translocation of contaminants, if it is shown to be a problem.
5. Ensure completion of construction of MRZs and remaining revegetation of the Cinder Bank (OU 2).
6. Complete negotiations with the PRPs for implementation of the October 9, 2001 ROD (OU 3).
7. Design and implement the October 9, 2001 ROD (OU 3).

Protectiveness Statements:

Operable Unit 1 - Blue Mountain: The remedy is expected to be protective of human health and the environment upon completion.

Operable Unit 2 - Cinder Bank: The remedy is expected to be protective of human health and the environment upon completion.

Operable Unit 3 - Community Soils: The remedy is expected to be protective of human health and the environment upon completion. However, until the remedy selected in the October 9, 2001 ROD is implemented, the following issues remain:

1. Homes with exterior soil lead levels above 650 ppm and which were not remediated during the interim removal action need to be evaluated in accordance with the ROD.
2. Playground areas in the residential communities need to be remediated in accordance with the ROD if lead levels are found above 400 ppm.
3. A notification mechanism to protect future residential buyers of homes found to have soil lead levels above 650 ppm but which will not be remediated needs to be implemented. [Protection of future residential buyers by instituting a notification mechanism needs to be implemented for homes found to have soil lead levels above 650 ppm but which will not be remediated.]

The following remedies for the above issues, as cited in the ROD issued on October 9, 2001, need to be taken to ensure protectiveness:

1. Exterior soil and interior dust remediation until clean-up standards are obtained in accordance with the ROD.
2. Sampling and clean up of residential play areas in accordance with the ROD.
3. In accordance with the ROD, implementation of Institutional Controls to notify potential buyers of a property of the existence of sampling information.

Consent Decree negotiations are currently underway between EPA and the PRPs for implementation of the above remedies.

Operable Unit 4 - Area-Wide Groundwater and Surface Water Investigation: A protectiveness determination cannot be made at this time until further information is obtained. Further information will continue to be obtained during the Remedial Investigation/Feasibility Study (RI/FS) currently underway. It is expected that the RI/FS will be completed by 2003, at

	which time a protectiveness determination will be made. It should be noted that exposure to groundwater is minimal since most of the potentially affected area is connected to a public water supply. The few nearby residential wells have been sampled and do not exhibit contaminants that can be currently attributed to on-site groundwater.
Other Comments:	No further comments at this time.

Second Five-Year Review Report
February 2002
Palmerton Zinc Pile Site – Palmerton, Pennsylvania
EPA ID No. PAD002395887

I. Introduction

The purpose of a Five-Year Review is to ensure that a remedial action remains protective of public health and the environment and is functioning as designed. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and provides recommendations to address them. This report documents the results of the review and will become a part of the site file.

The U. S. Environmental Protection Agency - Region III (EPA) prepared this Five-Year Review report pursuant to Section 121 (c) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. § 9621 (c); Section 300.430(f)(4)(ii) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300, as amended, and the Office of Solid Waste and Emergency Response (OSWER) Directives 9355.7-02 (May 23, 1991), 9355.7-02A (July 26, 1994), and 9355.7-03A (December 21, 1995).

CERCLA §121 states:

> If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The Agency interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

> If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedy.

EPA conducted this Five-Year Review of the remedies selected at the Palmerton Zinc Pile Superfund Site in Palmerton, Pennsylvania. This review was conducted by the Remedial Project Manager (RPM), Charlie Root, and Alexis K. Alexander, RPM, for the entire site from July 30, 2001, through December 31, 2001.

This is the second Five-Year Review for the Palmerton Zinc Pile Superfund Site. The triggering action for this policy review was the completion date of the first Five-Year Review report,

September 26, 1996 (Attachment 2). The Five-Year Review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

II. Background

Land and Resource Use

The Palmerton Zinc Pile Superfund Site (Site) is located in Carbon County, Pennsylvania, in the vicinity of the Lehigh Gap and is approximately 15 miles north of Allentown, Pennsylvania. Attachment 1 is the site location map. From 1898 to about 1981, zinc smelters were operated within the Borough of Palmerton (Borough). The two former zinc smelters are located separately on east and west sides of the Lehigh Gap where the Aquashicola Creek joins with the Lehigh River. The East Plant is at the eastern end of the Borough, located on the southern side of Aquashicola Creek at the foot of Blue Mountain. A smoldering slag pile known as the Cinder Bank lies adjacent to the East Plant and along the base of Blue Mountain. The Cinder Bank waste pile is approximately 2.5 miles long and covers approximately 200 acres. The West Plant is located in the western end of the Borough on the northern bank of the Lehigh River.

The site was included on the National Priorities List (NPL) in September 1983 because of the threat to human health and the environment posed by the Cinder Bank. Further investigation has indicated that elevated levels of heavy metals are prevalent throughout the Palmerton Area.

The East and West Plants were operated by the New Jersey Zinc Company from 1898 until 1967. During smelter operations, large amounts of lead, cadmium, zinc, and arsenic were emitted as dust and particulate fallout from stack emissions. The smelting operation was purchased from New Jersey Zinc in 1967 by Gulf & Western Industries, Inc. (G&W). In 1981, Horsehead Industries, Incorporated, (HII) purchased the smelters and began operating the facility as a hazardous waste recycling plant. HII is the parent company of two on-site subsidiaries, Horsehead Resource Development Company, Inc. (HRD) and Zinc Corporation of America (ZCA). HRD is responsible for research and development and ZCA is the facility operator. HII, HRD, and ZCA will be referred to collectively as "Horsehead" throughout this document. G&W is the predecessor of Viacom International Incorporated (Viacom) and TCI Pacific Communications, Incorporated, (TCI). Viacom and TCI will be collectively referred to as "Viacom" throughout this report. Viacom and Horsehead are the Potentially Responsible Parties (PRPs) at the site.

History of Contamination

The smelters emitted vast quantities of zinc, lead, cadmium, and sulfur dioxide over the years. This pollution led to the defoliation of approximately 2000 acres on Blue Mountain, deposition of heavy metal contamination within the Borough and the valley, and the stockpiling of approximately 32,000,000 tons of slag. The slag pile, which is called the Cinder Bank, caused pollution of the shallow aquifer and the Aquashicola Creek, which flows through the Borough into the Lehigh River. It was apparently common practice to deposit this slag material in this waste pile before it was fully quenched. Therefore, significant parts of the interior of the Cinder Bank continue to burn.

Surface soil samples taken on Blue Mountain revealed contamination levels of cadmium from 364 parts per million (ppm) to 1,300 ppm; lead from 1,200 ppm to 6,475 ppm; and zinc from

13,000 ppm to 35,000 ppm. Most of this contamination is contained within the top 6 to 10 inches of soil. This is because the metals are bound in organic materials which prevent more significant downward movement of metals.

Physical Characteristics

The Cinder Bank is approximately 2.5 miles long, 200 feet high, 200 feet wide at its crest, and 1,000 feet wide at the base. This equates to approximately 200 acres of surface area. The Cinder Bank consists of mostly residual metals and carbonaceous material. As a result of either incomplete quenching or spontaneous combustion, portions smolder continuously. The contamination within the Cinder Bank consists of approximately 3,600 ppm lead, 250 ppm cadmium, and 27,000 ppm zinc, as well as other metals.

Smelting operations ceased in both plants in about 1981. Since 1981, when HHI bought the facility, it has been operated as a hazardous waste recycling facility. It presently processes the RCRA hazardous waste K061, electric arc furnace (EAF) dust. This dust is a residue from the steel mill industry and contains significant levels of several hazardous metals, including lead, cadmium, and zinc.

Remedial Overview

EPA divided this Superfund Site into four Operable Units (OUs) because of its size and complexity. Operable Unit 1 (OU 1) addresses revegetation of approximately 2,000 acres of denuded, non-residential land on the north face of Blue Mountain. A ROD for OU 1 was issued on September 4, 1987. The selected alternative called for the application of a sludge/lime/fly ash mixture to the mountainside and revegetation using grass seed and tree seed. Grass cover has been established on approximately 775 acres of Blue Mountain, with approximately 1,000 acres remaining to be revegetated.

Operable Unit 2 (OU 2) consists of remediation of the Cinder Bank. The Cinder Bank, which is primarily a smoldering residue pile from historic zinc smelting operations, lies adjacent to the East Plant and along the base of Blue Mountain. The Cinder Bank waste pile is approximately 2.5 miles long and covers approximately 200 acres. A ROD for OU 2 was issued on June 29, 1988. Until recently, no significant work had been completed on the Cinder Bank. However, over the past two years, construction activities have progressed towards diverting surface water from Blue Mountain around the Cinder Bank; collecting and treating leachate coming from the Cinder Bank; and revegetating the Cinder Bank. This construction work on the Cinder Bank is expected to be completed in 2002.

Operable Unit 3 (OU 3) consists of remediation of residential soils and interior house dust exhibiting elevated levels of lead, which are a result of historic zinc processing operations. A ROD was issued on October 9, 2001. Currently, negotiations to implement the ROD remedies are underway between EPA and the PRPs.

Operable Unit 4 (OU 4) concerns an area-wide investigation of contamination in the ground and surface waters and includes an Ecological Risk Assessment. A Remedial Investigation (RI) of this OU is nearing completion and the Ecological Risk Assessment has been completed.

III. Remedial Actions

A. Operable Unit 1 (OU 1) – Blue Mountain

1. Remedy Selection

OU 1 consists of the revegetation of approximately 2,000 acres on Blue Mountain under an interim remedy. The Remedial Investigation and Feasibility Study (RI/FS) was conducted by EPA. The ROD was issued on September 4, 1987. The selected interim remedy utilized the application of a sludge/lime/fly ash mixture with grass seeds and tree seeds. While not addressing all applicable or relevant and appropriate requirements (ARARs), the selected alternative was deemed consistent with those action-specific ARARs addressing sludge application, a special concern of the Commonwealth of Pennsylvania Department of Environmental Protection (PADEP), which accepted the remedy selected in the ROD.

The Remedial Action Objectives of the ROD are as follows:

1. minimize direct contact with contaminated soil
2. reduce volume of runoff
3. reduce contamination in runoff
4. mitigate environmental damage

2. Remedy Implementation

A Consent Decree (CD) between EPA and ZCA, a Division of HII, for implementation of the ROD for OU 1 was entered by the United States District Court for the Middle District of Pennsylvania on October 18, 1988. The final plans to implement the remedy were received by EPA on April 15, 1991, for remediation of up to 1000 acres. Approval to start construction was given to ZCA by EPA on May 7, 1991.

The U.S. Army Corps of Engineers (USACE), located in Tobyhanna, Pennsylvania, has been EPA's Remedial Action (RA) oversight contractor since 1990.

The ROD refers to the remediation of approximately 2,000 acres; however, the exact limits of restoration were not precisely established. Ultimately, 775 acres underwent the sludge/lime/flyash plus grass/tree seeds application process by 1996 under the terms of the 1988 CD until ZCA stopped work. A disagreement between EPA and ZCA regarding ZCA's responsibility to continue work under the 1988 CD was never resolved and in December 1999, EPA issued a Unilateral Administrative Order (UAO) to Horsehead and Viacom requiring completion of the remedial activities selected in the ROD.

The revegetation remedial action over the 775 acres was highly successful in establishing grass cover. However, due primarily to unsuccessful competition with the newly established grass, and to a lesser extent, predation from small rodents and deer repopulating the grassy areas, etc., tree seeding was not successful.

A timber survey conducted in 1994-1995 by Horsehead identified areas where sufficient tree density per the requirements of the remedial design (435 live trees per acre) already existed due to volunteer species.

An audit report of the remedial action completed on 775 acres was prepared and submitted to EPA on January 25, 1995, by the USACE Waterways Experiment Station (WES), and the USACE Cold Regions Research and Engineering Laboratory (CRREL) assessing the restoration success of the interim remedial action. The findings of the report confirmed the success in establishing grass cover, the establishment of indigenous volunteer birch and poplar species known to take up metals, and the lack of success in establishing woody species from the initial seeding. This audit report is included as Attachment 3 of this report.

Due to the lack of success of tree seeding, and at the suggestion of EPA, ZCA planted test plots of tree seedlings in late 1995. This involved breaking through surface soil with a dibble bar and then planting seedlings into the subsoil. Some seedlings were augmented by ECOLOAM to allow the taproot access to soil below the contaminated layers. This effort utilized low metals uptake species (oak and maple).

Beginning with the initial plantings by Horsehead in 1995, USACE, on behalf of EPA, has monitored the progress of the tree seedlings and taken various actions in an attempt to ensure the seedlings' successful maturation. These actions have included; 1) cutting all grass in a 3.3 ft. area with a weed-whacker prior to dibble barring the seedling into the ground, in an attempt to minimize competition from grass, 2) inoculating the seedlings with a microrhizium developed for contaminated soils prior to planting; 3) applying an animal repellant and an iron chelate (FeEDDHA) to seedlings; and 4) using insect control as needed. Later, a ground weed control mat (3x3 ft.) or other control was applied around the seedlings in the Spring of 1998. A plastic protective tube was placed around the seedlings at planting in November 1997 to protect from animal grazing. The plastic tube used was ineffective because during windy conditions on the mountain it caused massive wind damage to the seedlings. A netting type of seedling protector was applied in March 1998. Seedling survivability and growth were observed every one to two months throughout the growing season each year.

Despite these extensive efforts, the 1995 tree seedling planting performed poorly and at the request of EPA, USACE planted an additional round of tree seedlings in November 1999. This was done to see if the accumulated knowledge from the previous efforts with the 1995 tree seedlings could be used successfully on newly planted tree seedlings. The November 1999 demonstration was conducted in the plots that had the fewest surviving seedlings from the 1995 planting. Inoculated oak seedlings (45 2-3 year old red oak seedlings, 90 2-3 year old shuwater oak seedlings and 45 2-3 year old red maple seedlings) were planted between the rows previously planted in the 0-100 ft., 100-200 ft., 200-300 ft., and/or 300-400 ft. sections at spacings of 10 ft.

An evaluation of the tree seedling demonstrations, as well as the overall revegetation remedial action, was performed at the request of EPA by a USACE soil scientist, Charles R. Lee, Ph.D., CPSS, and submitted to EPA on March 13, 2001. Dr. Lee's findings included indications of an apparent increase in plant litter in areas where grass had previously been well established, coupled with the decrease in live vegetative cover and the lack of success in establishing woody species via seeding and tree seedlings. In response to the obvious difficulty in creating successful forestland through either seeding or seedling planting, a cost analysis of establishing meadowland versus forestland was also included in the evaluation. This cost comparison

estimated meadowland establishment as $1,125/acre versus $6,125/acre for forestland via tree seedling planting and intensive seedling maintenance. The meadowland establishment evaluation also included recommendations for maintenance of unwanted volunteer woody species. This maintenance effort was included in the cost analysis. A copy of Dr. Lee's evaluation is included as Attachment 4 of this report. Based on the experiences and evaluations of the initial ROD implementation, EPA has adopted the following approach to implement the ROD on the remaining acreage: utilize a self-sustaining meadowland revegetation approach that has minimum metal uptake; sample and analyze appropriate indicator plant species for metals to determine if any uptake is occurring; and periodically remove volunteer tree species with high metal uptake (i.e., Birch, Poplar, etc.), if necessary.

As stated previously, EPA issued a UAO to Horsehead and Viacom on December 10, 1999, for remediation of the remaining portion of the ROD acreage on Blue Mountain. Viacom is currently complying with the UAO.

Viacom has hired the consulting firm of Adrian Brown to prepare the remedial design and oversee the implementation of the remedy on the remaining portions of the mountain. EPA is conducting oversight of the remedial design and remedy with the assistance of USACE. Adrian Brown, on behalf of Viacom, submitted a preliminary design which would include application of seed, manure, fertilizer, fly ash, and lime from the air to complete the revegetation of Blue Mountain called for in the ROD. The preliminary design also called for conducting a Field Pilot Test Plan (Plan) utilizing varying mixtures of sludge, seed mix, fly ash, and lime to determine the most effective ratio. The Plan included twelve randomly selected one-acre test plots and consisted of three separate aerial application steps. Attachment 5 is Viacom's September 27, 2000 map showing the test plot locations. The first step in implementing the Plan was the application of a seed mix using a spreader bucket (inverted cone hopper) suspended by helicopter. The second step was an application of lime using the same method. The third and final step involved the application of a manure/compost mixture. Due to problems encountered with application of the compost using the hopper, a change was made to apply the compost using a tarp and sling method. The test plot applications were completed in October 2000 with the expectation that the success of the applications would be evaluated and performance standards for full-scale application would be agreed upon in the Spring and Summer of 2001. EPA has solicited input and received comments on the evaluation of the test plots from PADEP and the United States Department of Interior (DOI).

Several problems and concerns with the Plan regarding the application rates and coverage were noted in a USACE March 14, 2001 letter (Attachment 6). DOI has also raised various concerns to EPA regarding the remedial approach. Subsequent field inspections confirmed several of the deficiencies noted regarding application rates, uniform coverage, areal extent to be remediated, types of grasses to be utilized, and performance standards. Two site visits were conducted by EPA and included representatives of the PRP, USACE, DOI, and PADEP. The visits were conducted in May 2001, and on September 11, 2001, to view the success rates of the test plots. During these visits it was determined that preliminarily two of the twelve test plots had been initially successful in establishing vegetative cover. However, EPA decided that further evaluation of the plots through Spring 2002 was warranted due to concerns regarding long-term survivability of the grass seeding. A report detailing the test plot application, observations, and evaluations from the site visit was submitted by Adrian Brown on behalf of Viacom on January 10, 2002. The report also suggested possible resolutions for concerns raised regarding the preliminary design approach, including modifications to the application methods and suggestions

regarding performance standards. EPA and other interested parties including DOI and PADEP evaluated this report and provided comments and recommendations to Viacom. The comments and recommendations are to be taken into account in a second test plot work plan to be prepared by Viacom. Depending upon the resolution of the concerns raised regarding the remedial approach, it is expected that full scale remedy applications via this approach would begin no sooner than Fall 2002.

B. Operable Unit 2 (OU 2) - Cinder Bank

1. Remedy Selection

OU 2 consists of remediation of the Cinder Bank. The Cinder Bank, which is primarily a smoldering residue pile from historic zinc smelting operations, lies adjacent to the East Plant and along the base of Blue Mountain. The Cinder Bank waste pile is approximately 2.5 miles long and covers approximately 200 acres. In September 1985, ZCA entered into an Administrative Order on Consent (AOC) to conduct a RI/FS for the Cinder Bank. The RI/FS was submitted to EPA in May 1988 and accepted by EPA. A ROD for OU 2 was issued on June 29, 1988.

The Remedial Action Objectives of the ROD are as follows:

1. minimize direct contact with the Cinder Bank
2. reduce volume of run-off
3. reduce contamination in run-off
4. reduce the volume of run-on
5. collect and treat leachate
6. reduce wind-borne contaminated emissions
7. reduce particulate erosion

This OU has been the subject of controversy between the PRPs, PADEP, and EPA, due to the imposition of the State's Municipal Landfill Regulations on the Cinder Bank remedy. When the ROD was issued, PADEP asserted that the slope modifications must meet their Municipal Landfill Regulations and that the fires within the Cinder Bank must be extinguished. As a result, EPA's contractor, Black & Veatch Waste Sciences, Inc. prepared an Engineering Evaluation and Cost Analysis (EE/CA) for the selected remedy. The EE/CA estimated that the cost to implement the selected remedy, including installation of a cap which met PADEP's regulations and extinguishing the interior fires, would be approximately $250 million.

Subsequent to the signing of the ROD, ZCA agreed to perform additional studies in support of a possible alternative remedy. These studies included an air monitoring program to determine if the fires presented an environmental threat and the investigation of some of the latest recycling technology relating to the slag itself. Work began in 1992 and was completed in 1994. The result of the studies indicated that there were no environmental risks as a result of air emissions from the Cinder Bank and that recycling of the slag itself was not economically feasible.

2. Remedy Implementation

On November 13, 1995, EPA entered into a CD with Horsehead which resolved a Complaint filed against Horsehead alleging multiple violations of the Resource Conservation and Recovery Act (RCRA), the Clean Air Act (CAA), and the Clean Water Act (CWA). The CD required the preparation of a plan called the Pollution Reduction Technology plan (PRT Plan) to address the multi- media concerns raised in the Complaint. The PRT Plan includes a revegetation project for the Cinder Bank in conjunction with leachate collection and treatment and surface water diversion. This approach was specifically advanced as a means of achieving effluent discharge limits under the CWA as described in that CD.

The PRT Plan and Cinder Bank Vegetation Plan ("Vegetative Plan") were prepared and submitted by HII in February 1999. EPA and PADEP approved the PRT Plan in March 2000. Shortly thereafter, work began on the PRT Plan in April, 2000. Work to be completed under the PRT Plan includes the following:

1. The Vegetation Plan provides for the continuation of vegetation of the Cinder Bank (in a manner similar to Blue Mountain). Approximately 68 of the 200 acres of the Cinder Bank were vegetated between the early 1980's and the early 1990's for erosion control. Completion of the Vegetation Plan will accomplish at least four technical objectives: (1) reduce wind and water erosion, (2) increase evapotranspiration, (3) decrease the amount of runoff and groundwater recharge, and (4) reduce Cinder Bank leachate. Approximately 132 acres of the Cinder Bank have not been vegetated. Of these, approximately 27 acres are associated with areas at which there may continue to be residual burning. For safety reasons, these limited areas will not be vegetated.

During the 2000 work season, 45 acres of the Cinder Bank were revegetated. During the 2001 construction work season 45 additional acres were revegetated.

2. The construction of surface water diversion channels to collect runoff from Blue Mountain and the Cinder Bank. A riprap lined and grouted ditch identified as the Eastern Diversion Ditch (EDD) intercepts water from the north side of Blue Mountain and is located between Blue Mountain and the Cinder Bank. It intercepts and conveys water starting from the Pretreatment Zone (see description below) and around the entire eastern side of the Cinder Bank. A second diversion system known as DT005 consists of two sections of half round corrugate metal pipe (CMP). DT005 has two separate reaches, one that extends to the western side and one to the eastern side of the Cinder Bank in the vicinity of the EDD. The pitch includes 48" and 60" half round CMP and incorporates a series of culverts, manholes, and water correction zones.

3. The construction of a pretreatment zone on the east side of the Cinder Bank which includes the placement of 25,000 tons of iron rich material (IRM) over a 10 acre area and the construction of three metals reduction zones. The three metal reduction zones (MRZs) consist of large excavations at the toe of the Cinder Bank which have a geosynthetic clay liner (GCL), a series of PVC piping for influent and effluent, IRM backfill treatment media, and then a vegetative cap. The intent of the MRZs is to capture Cinder Bank leachate and treat it prior to discharge to the Aquashicola Creek. Also, the MRZs include the construction of two pH adjustment structures. The pretreatment zone and MRZs will have ECOLOAM applied along with a vegetative cover.

Work on the construction required by the PRT Plan has been ongoing since April 2000. To date the eastern diversion ditch and the DT005 surface water diversion piping have been completed, MRZ #3 has been constructed, and the Pretreatment zone has been completed. Work will continue through the 2002 construction season toward completing the construction of MRZ #1 and MRZ #2 and completing the revegetation of the Cinder Bank.

EPA and PADEP have been reevaluating the remedy for this OU based upon the results of the EE/CA performed by Black & Veatch, the additional studies performed by Horsehead, and the work performed by Horsehead under the PRT plan. EPA is now evaluating whether the work required under the PRT Plan will meet the objectives of the 1988 ROD.

C. Operable Unit 3 (OU 3) – Community Soils

OU 3 consists of remediation of residential soils and interior house dust exhibiting elevated levels of lead from zinc processing activities in the Borough of Palmerton, the Village of Aquashicola, and other residential areas of Lower Towamensing Township.

In September 1985, EPA entered into an AOC with G&W, a former owner/operator of the Site. Under the terms of that agreement Gulf and Western agreed to conduct a RI/FS for OU 3. The draft RI for OU 3 was completed in 1988 and forwarded to EPA. In response to comments from EPA, Paramount Communications, Incorporated, (formerly Gulf and Western Industries, Incorporated, now known as Viacom International Incorporated), submitted a revised RI in 1994. EPA deemed the RI deficient and took over the RI/FS for this OU.

In February 1991, the Pennsylvania Department of Environmental Resources (PADER), now known as the Pennsylvania Department of Environmental Protection (PADEP), sampled dusts in two houses in Palmerton. The results of these samples indicated high levels of lead, cadmium, and zinc. At the request of PADEP, EPA conducted additional sampling at 24 homes in Palmerton. The sampling results from the additional 24 homes correlated with PADEP results. At that time, EPA amended the 1985 AOC with Horsehead and Horsehead agreed to conduct an interior cleanup of the homes. Horsehead completed the cleanup activities in Spring 1992. EPA also issued a UAO to Paramount Communications, Incorporated, to undertake an extent-of-contamination study to determine the possibility of additional contaminated households. The activities required by EPA in the UAO issued to Paramount Communications, Incorporated, were performed but because so few residents would allow sampling on their properties, the study did not, in EPA's opinion, fully define the environmental contamination of the residential communities.

In October 1991, EPA conducted a comprehensive environmental sampling program in Palmerton in conjunction with the Agency for Toxic Substances and Disease Registry (ATSDR) health testing program. Analytical results were received by EPA in October 1992. Those results showed elevated levels of lead, cadmium, and zinc in surface soils and in household dust. In January and February of 1993, EPA received additional results and reviewed the population make-up in the areas sampled. Based on the sample results, and the make-up of the receptor population, the EPA Remedial Project Manager (RPM) requested EPA removal assistance to mitigate immediate threats to human health, welfare, and the environment posed by the presence of high levels of contamination in residential areas. The EPA On Scene Coordinator (OSC)

deemed that Removal Activities were necessary to mitigate threats to public health posed by the Site.

EPA conducted an Interim Removal Action from 1994 through 1997. This action addressed the immediate threats to children and pregnant woman, which are the most sensitive populations, from high levels of lead, cadmium, and arsenic in exterior soil surrounding the nearby residential community as well as interior dust in their homes. A total of 438 houses were sampled during the four-year period covering the Interim Removal Action. A total of 202 houses were cleaned during the four-year period, of which 116 were cleaned on the interior (including, High Efficiency Particulate Arresting (HEPA) vacuuming and carpet removal/replacement) and 195 were cleaned on the exterior (excavation of upper 2 inches of most contaminated soil and tilling in of agricultural amendments or clean top soil).

1. Remedy Selection

EPA also conducted a Baseline Risk Assessment (BRA) for this OU to determine the long-term risk, if any, associated with the elevated levels of lead, cadmium, and arsenic in the community. This BRA, which was completed in early 1999, was used to prepare the final Feasibility Study. The final Feasibility Study, which evaluated remedial alternatives to address the risks identified in the BRA, was completed in June 2000. EPA issued the ROD for OU 3 on October 9, 2001, to address the risks identified in the BRA.

The ROD includes a Selected Remedy and Contingent Remedy as described below. Both will address the lead and arsenic contaminated exterior residential soil source and will address the tracked in exterior soil in interior dust. The Selected Remedy will also include evaluation and, if necessary, abatement of lead-based paint. However, the Selected Remedy is contingent upon EPA and the PRPs reaching a Consent Decree whereby the PRPs agree to implement the remedy. If such an agreement cannot be reached, the Contingent Remedy will address the industrial sources of lead contamination and leave the properties within the OU 3 area on a level playing field with all other homes in the United States constructed prior to 1978 with regard to lead-based paint.

The Selected Remedy includes the following major components:

Soliciting participation in the remedial action through letters, fact sheets, local media outlets, and personal contacts;

Eligibility sampling based on 650 ppm lead in a representative composite soil sample;

Lead-based paint evaluation and abatement, if necessary, and HEPA vacuuming of home interiors until clearance standards consistent with Subpart D of 40 CFR Part 745 are attained.

Exterior soil remediation, including tilling in either pre-amended soil or agricultural-type amendments, and/or excavation, removal, and proper disposal of targeted soils until appropriate cleanup standards are attained. (A cleanup standard of 950 ppm lead in soil, as determined through composite sampling, shall be applied in exterior soils only if any potential source of interior lead dust contamination from lead-based paint is identified and, if present, addressed appropriately, or lead-based paint is determined not to pose a risk, as determined by a state-licensed risk assessor. Otherwise, an exterior soil cleanup standard of 650 ppm shall apply).

Sampling and cleanup of residential play areas, if present.

Institutional controls to notify potential buyers of a property of the existence of sampling information in the situation where sampling indicates the eligibility of a property and the property owner declines to have the appropriate cleanup performed.

The Contingent Remedy incorporates residential exterior soil, and specialized interior cleaning remedial actions for all homes that qualify for such remediation and in which property owners consent to participate. Exposure to exterior soils and interior dust above cleanup standards represents a primary threat to human health; therefore, the action described below will be required.

The Contingent Remedy includes the following major components:

Soliciting participation in the remedial action through letters, fact sheets, local media outlets, and personal contacts;

Eligibility sampling based on 650 ppm lead in a representative composite soil sample for exterior soils and 650 ppm interior dust sample;

Exterior soil remediation, including tilling in either pre-amended soil or agricultural-type amendments, and/or excavation, removal, and proper disposal of targeted soils until the 650 ppm cleanup standard is attained.

Sampling and cleanup of residential play areas, if necessary.

Specialized interior cleaning, including HEPA vacuuming, wet wiping of hard surfaces, and clearance sampling consistent with Subpart D of 40 CFR Part 745 for floors.

Institutional controls to notify potential buyers of a property of the existence of sampling information in the situation where sampling indicates the eligibility of a property and the property owner declines to have the appropriate cleanup performed.

2. Remedy Implementation

Viacom has indicated its willingness to implement the ROD and has begun preparation of a Remedial Design Work Plan. A Consent Decree is currently being drafted so that negotiations for implementation of the ROD can continue.

D. Operable Unit 4 (OU 4) – Area-wide Groundwater/Surface Water Investigation

OU 4 concerns an area-wide investigation of contamination in the ground and surface waters and includes a Site-wide Ecological Risk Assessment. EPA sent Special Notice letters to the Potentially Responsible Parties for the Site on December 22, 1995, offering them the opportunity to perform the RI/FS for OU 4. The PRPs declined and EPA decided to perform the RI/FS using money from Superfund rather than issuing Unilateral Administrative Orders for performance of the work. In consideration of community concerns regarding the groundwater investigation, EPA determined that the RI would be performed in three phases. The first phase included the evaluation of all existing groundwater data including existing routine monitoring well data collected by Horsehead. EPA also sampled existing on-site monitoring wells and four residential wells. The results of this evaluation were used to determine that no new well

installations were necessary prior to moving forward to complete the RI/FS. The results of the first phase of the investigation were made part of an EPA presentation given to the concerned citizens on April 21, 1999. Since then, EPA has begun work on the RI and has also conducted additional sampling of existing monitoring and residential wells to supplement the existing data. The field work for the Ecological Risk Assessment part of the Remedial Investigation took place during 1997 and 1998.

Currently, the RI for this OU is nearing completion and the Ecological Risk Assessment has been completed and will be incorporated into the RI. The FS and ROD are expected to be completed by early 2003.

IV. Progress Since the Last Review

A. Blue Mountain - Operable Unit 1:

Additional tree seedlings were planted in November 1995.
An EPA Unilateral Administrative Order (UAO) was issued on December 10, 1999, to Horsehead and Viacom to remediate the remaining portion of the ROD acreage on Blue Mountain.
Under the UAO, Viacom hired the consulting firm of Adrian Brown to prepare the remedial design and oversee the implementation of the remedy on the remaining portions of the mountain.
Adrian Brown developed a Field Pilot Test Plan and implemented this plan on 12 test plots.

B. Cinder Bank - Operable Unit 2:

A Consent Decree, settling Clean Air Act, Clean Water Act, and RCRA violations, was entered into between HII/HRD, PADEP, and EPA. This CD resulted in the PRT Plan which addressed Cinder Bank concerns.
Construction required by the PRT Plan began in April 2000. Construction of the eastern diversion ditch, the DT005 surface water diversion piping, and the Metal Reduction Zone (MRZ) #3 has been completed. MRZ #1 and #2 remain to be constructed and revegetation of the Cinder Bank to be completed.

C. Community Soils - Operable Unit 3:

An EPA Interim Removal Action was conducted from 1994 to 1997 to address the immediate threats to children and pregnant women from high levels of lead, cadmium, and arsenic in the exterior soil surrounding the residential community, as well as the interior dust in the homes.
A risk assessment to determine the long term risks was completed in March 1999.
A Record of Decision (ROD) was issued on October 9, 2001.

D. Area-wide Groundwater and Surface Water - Operable Unit 4:

EPA conducted the groundwater investigation in three phases in response to community concerns. The first phase included the evaluation of all existing groundwater data. This evaluation showed that the second phase, the installation of shallow monitoring wells, was not necessary.

The field work for the ecological portion of the Remedial Investigation was begun in 1997 and completed by 1998. This completed Ecological Risk Assessment will be incorporated into the Remedial Investigation, currently nearing completion.

V. Five-Year Review Process

Interested parties were notified of the start of the review. The review team consisted of the Site RPM, Charlie Root, and Alexis K. Alexander, another EPA RPM. The review was conducted from approximately July 30, 2001, through December 31, 2001. The previous Five-Year Review, all of the associated RODs for each OU, and supporting correspondence were reviewed during this period. A site inspection was conducted on September 11, 2001.
Field conditions on the first 1000 acres confirmed the successful establishment of vegetation. Some areas showed vegetative die off while other areas showed a proliferation of certain volunteer species. As discussed earlier in the Remedial Actions section for OU 1, two of the test plots initially appeared successful in establishing vegetation. However, field inspections confirmed deficiencies regarding application rates, uniform coverage, areal extent to be remediated, types of grasses to be utilized, and performance standards.

VI. Technical Assessment

A. Is the remedy functioning as intended by the decision documents?

Construction completion has not been achieved to date. The portions of the remedies implemented thus far appear to be functioning as intended by the decision documents.

B. Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?

Yes, however, limited sampling results may indicate that translocation of contaminants may be occurring through plant uptake in the revegetated acreage of Blue Mountain. Further sampling and evaluating needs to be conducted to determine if translocation of contaminants is occurring and if corrective actions need to be implemented.

C. Has any other information come to light that could call into question the protectiveness of the remedy?

No. However, see B. above.

Technical Assessment Summary:

The revegetation efforts implemented and currently being piloted on Blue Mountain (OU 1) and the Cinder Bank (OU 2) will need to continue to be monitored to ensure the vegetation's long-term survivability. Accordingly, appropriate O&M procedures will need to be implemented. The remedy selected for Operable Unit 3 needs to be implemented and the remedy for Operable Unit 4 needs to be selected and implemented.

VII. Protectiveness Statements:

Operable Unit 1: The remedy is expected to be protective of human health and the environment upon completion.
Operable Unit 2: The remedy is expected to be protective of human health and the environment upon completion.
Operable Unit 3: The remedy is expected to be protective of human health and the environment upon completion. However, until the remedy selected in the October 9, 2001 ROD is implemented, the following issues remain:

Homes with exterior soil lead levels above 650 ppm and which were not remediated during the interim removal action need to be evaluated in accordance with the ROD.
Playground areas in the residential communities need to be remediated if lead levels are found to be above 400 ppm.
A notification mechanism to protect future residential buyers of homes found to have soil lead levels above 650 ppm but which will not be remediated needs to be implemented.

The following remedies for the above issues, as cited in the ROD issued on October 9, 2001, need to be taken to ensure protectiveness:

Exterior soil and interior dust remediation until clean-up standards are obtained in accordance with the ROD.
Sampling and clean-up of residential play areas in accordance with the ROD.
Implementation of Institutional Controls to notify potential buyers of a property of the existence of sampling information in accordance with the ROD.

Consent Decree negotiations are currently underway between EPA and the PRPs for implementation of the above remedies.

Operable Unit 4: A protectiveness determination cannot be made at this time until further information is obtained. Further information will continue to be obtained during the RI/FS currently underway. It is expected that the RI/FS will be completed by early 2003, at which time a protectiveness determination will be made. It should be noted that exposure to groundwater is minimal since most of the potentially affected area is connected to a public water supply. The few nearby residential wells have been sampled and do not exhibit contaminants that can be currently attributed to on-site groundwater.

VIII. Issues

Operable Unit #1 - Blue Mountain

Although revegetation via grass seed was highly successful, initial tree seeding of the 775 remediated acres on Blue Mountain (OU 1) and a subsequent planting of tree seedlings has not been successful. In addition, limited sampling data may indicate that translocation of contaminants is occurring through plant uptake. The extent of translocation of contaminants through plant uptake and it's effects on the revegetated acreage, if any, need to be determined.

The remaining denuded acres of Blue Mountain (OU 1) need to be revegetated. Application rates, uniform coverage, areal extent to be remediated, types of grasses and performance standard issues in test plots need to be resolved for proposed Viacom design.

Operable Unit #2 - Cinder Bank

Construction of Metal Reduction Zones (MRZs) and remaining revegetation on the Cinder Bank needs to be completed(OU 2). Access restrictions and long term O&M issues of Cinder Bank need to be addressed (OU 2).

Operable Unit #3 - Community Soils

EPA and the PRPs need to complete Consent Decree negotiations and then design and construct the remedy called for in the October 9, 2001 ROD (OU 3).

IX. Recommendations and Follow-Up Actions

Operable Unit #1 - Blue Mountain

The completed portion of Blue Mountain should be monitored and evaluated for long term vegetation survivability and translocation of contaminants. Appropriate plant species should be sampled and analyzed for metals to determine if translocation is occurring. If it is occurring, what adverse effects it is causing, if any, should be determined. If it is determined that translocation of contaminants through plant uptake of metals is causing adverse effects then periodically, on an as-needed basis, removal of volunteer tree species with high metal uptake (i.e., Birch, Poplar, etc.), repair of areas of vegetative die off, or application of soil amendments to minimize contaminant uptake may be implemented.

On the remaining acreage of Blue Mountain a revegetation approach that has minimal metal uptake to ensure long term survivability and minimize translocation of contaminants, if it is shown to be a problem, should be implemented.

Operable Unit #2 - Cinder Bank

Completion the construction of the MRZs and the remaining revegetation should be ensured. Operation and Maintenance of the Cinder Bank remedies needs to be implemented.

Operable Unit #3 - Community Soils

Complete Consent Decree negotiations with PRPs for implementation of the October 9, 2001 ROD and begin the design and implementation of the ROD.

X. Next Five-Year Review

This Site involves long-term remediation and therefore another policy review will be required. The next Five-Year Review will be due five years from the signature date of this Five-Year Review report.

Tables

TABLE 1. SITE CHRONOLOGY

DATE	DESCRIPTION	OPERABLE UNIT #
1898 – 1967	Zinc smelters operated by New Jersey Zinc Company.	N/A
1967 – 1981	Zinc smelters operated by Gulf & Western Corporation.	N/A
1981	Horsehead Industries, Incorporated, purchased the smelters and began operating the facility as a hazardous waste recycling plant.	N/A
September 1983	Site listed on the NPL.	N/A
September 1985	EPA entered into an Administrative Order on Consent (AO) with Horsehead Industries, Incorporated, and the current owner/operator of the Site, The New Jersey Zinc Company, a division of HII. Under the terms of this AO, HII agreed to conduct a Remedial Investigation/Feasibility Study (RI/FS) for OU 2 and Gulf & Western Industries, Incorporated, agreed to conduct a RI/FS for OU3.	2 & 3
September 4, 1987	Record of Decision (ROD) issued which called for the revegetation of 2000 acres on Blue Mountain.	1
1988	The Draft RI was completed by Paramount Communications, Incorporated, (formerly Gulf and Western Industries, Incorporated). EPA deemed the RI/FS deficient and subsequently took over the RI/FS for this OU.	3
June 29, 1988	Record of Decision issued for OU 2, remediation of the Cinder Bank.	2
October 18, 1988	Consent Decree entered into between EPA and ZCA, a division of HII, to implement the ROD.	1
1990	U.S. Army Corps of Engineers (USACE) contracted to be the Remedial Action oversight contractor for EPA.	1
1991 – 1996	775 acres out of the 2000-acre total underwent the remediation application process.	1
February 1991	PADEP, then known as PADER, conducted sampling of two homes in Palmerton which showed high levels of lead, cadmium, and zinc. PADEP then requested EPA sample an additional 24 homes. The results from sampling these additional homes also showed high levels of lead, cadmium, and zinc.	3
May 7, 1991	EPA approval to start construction was given to ZCA.	1
October 1991	EPA and ATSDR conducted a comprehensive sampling program in Palmerton.	3
October 1992	EPA received the sampling results received from the joint EPA/ATSDR sampling conducted in Palmerton. The results showed high levels of lead, cadmium, and zinc in the household dust and surface soils surrounding the residential homes.	3

Jan/Feb 1993	EPA received additional results supporting the high metal content of the previous sampling results. An On-Scene Coordinator (OSC) from the EPA Removal Branch was called in to mitigate the health threats posed by the Site.	3
1994 -1997	EPA's Removal Branch conducted an Interim Removal Action to address the immediate health threats to children and pregnant women due to the high levels of lead, cadmium, and zinc.	3
January 25, 1995	USACE Audit Report of the 775 remediated acres submitted to EPA.	1
November 13, 1995	EPA entered into a Consent Decree with Horsehead to resolve multiple violations of RCRA, CAA and CWA. Under the CD, Horsehead must remediate the Cinder Bank to meet effluent discharge limits.	2
1995	ZCA stopped remediation work on OU 1 due to disagreement regarding their responsibility to continue work under the 1998 Consent Decree. This dispute is still unresolved.	1
December 22, 1995	EPA sent Special Notice Letters to the PRPs, which contained an offer for them to perform the RI/FS for OU 4. After the PRPs declined this offer, EPA decided to perform the RI/FS using Superfund monies.	4
1997 & 1998	EPA conducted field work associated with the ecological aspects of OU 4.	4
March 1999	EPA completed a Baseline Risk Assessment as part of the Remedial Investigation (RI) to determine the long-term risk associated with the high metal levels in the residential areas.	3
February 1999	HII submitted the PRT Work Plan to EPA.	2
November 1999	ZCA planted an additional round of tree seedlings.	1
December 10, 1999	EPA issued a Unilateral Administrative Order (UAO) to Horsehead and Viacom to remediate the remaining OU 1 acreage.	1
March 2000	EPA approved the PRT Work Plan.	2
April 2000	PRT Work Plan construction initiated.	2
June 2000	EPA completed the Feasibility Study, which was based on the 1999 Baseline Risk Assessment.	3
October 2000	The Adrian Brown consulting firm, hired by Viacom to remediate the remaining acreage under the UAO, completed test plot applications on 12 one-acre sites.	1
March 13, 2001	USACE soil scientist, Dr. Charles R. Lee, Ph.D., CPSS, submitted an evaluation of the tree seedling plantings to EPA. This evaluation is known as "The Dr. Lee Report".	1
March 14, 2001	USACE letter submitted to EPA regarding application rates and coverage concerns of the Adrian Brown test plots.	1

May 2001	Site visit conducted by EPA, and representatives of the PRPs, DOI, PADEP and USACE to view the success rate of the test plots.	1
September 11, 2001	Second site visit conducted by EPA, and representatives of the PRPs, DOI, PADEP and USACE to view the success rate of the test plots.	1
January 2001	Adrian Brown draft report detailing the observations, evaluations, and potential resolutions regarding the test plots submitted to EPA.	1
October 9, 2001	EPA issued ROD for OU 3.	3

TABLE 2. ISSUES

ISSUE #	ISSUE	AFFECTS CURRENT PROTECTIVNESS (Y/N)	AFFECTS FUTURE PROTECTIVNESS (Y/N)
1	Although revegetation via grass seed was highly successful, initial tree seeding of the 775 remediated acres on Blue Mountain (OU 1) and a subsequent planting of tree seedlings has not been successful. In addition, limited sampling data may indicate that translocation of contaminants is occurring through plant uptake. The extent of translocation of contaminants through plant uptake and it's effects on the remedy, if any, need to be determined.	N	Y
2	Remaining denuded acreage of Blue Mountain (OU 1) needs to be revegetated. Application rates, uniform coverage, areal extent to be remediated, types of grasses, long term survivability and performance standard issues in test plots need to be resolved.	Y	Y
3	Complete construction of Metal Reduction Zones (MRZs) and remaining revegetation on the Cinder Bank (OU 2).	Y	Y
4	Address access restrictions and long term O&M of burning areas of Cinder Bank (OU 2).	Y	Y
5	Need to design and construct the remedy called for in the October 9, 2001 ROD (OU 3).	Y	Y

Table 3. Recommendations and Follow-up Actions

ISSUE #	Recommendations and Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					CURRENT	FUTURE
1	Monitor and evaluate the completed portion of Blue Mountain for long term vegetation survivability and translocation of contaminants (OU 1).	PRPs	EPA	Summer/ Fall 2002	N	Y
2	Sample and analyze appropriate plant species for metals to determine if any uptake is occurring.	PRPs	EPA	Summer/Fall 2002	N	Y
3	Periodically, on an as-needed basis, if appropriate, remove volunteer tree species with high metal uptake (i.e., Birch, Poplar, etc.) (OU 1), repair areas of vegetative die off, or apply soil amendments to minimize contaminant uptake.	PRPs	EPA	As necessary	N	Y
4	Utilize a revegetation approach that has minimum metal uptake on the remaining acreage of Blue Mountain (OU 1) to ensure long term survivability and minimize translocation of contaminants, if it is shown to be a problem.	PRPs	EPA	Fall/ Spring 2002- '03	Y	Y
5	Ensure completion of the construction of the MRZs and the remaining revegetation (OU2).	Horsehead	EPA	Spring/ Summer 2002	Y	Y
6	Complete negotiations with PRPs for implementation of the October 9, 2001, ROD (OU 3).	EPA/PRPs	EPA	Spring/ Summer 2002	Y	Y
7	Design and implement the October 9, 2001 ROD (OU 3).	PRPS	EPA	Summer/Fall 2002	Y	Y

Attachments